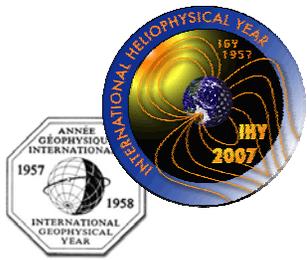


PLANS FOR THE INTERNATIONAL HELIOPHYSICAL YEAR (IHY)

*An international program of scientific
research to understand external drivers of the
space environment and climate*

North American IHY Planning Workshop

March, 2005



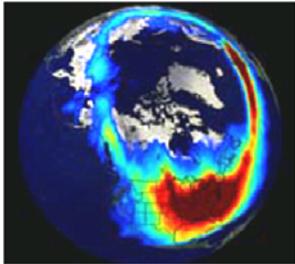
Why IHY? Historical Perspective

- **First International Polar Year**

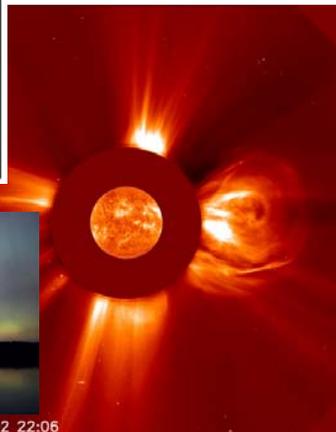
- *January 1875 at the Academy of Sciences in Vienna Carl Weyprecht suggested a coordinated study of the north polar region*
- *Polar meteorological and magnetic observations commenced on Aug 1, 1882 and concluded Sep 1, 1883*

- **Second International Polar Year**

- *Scientific activities were significantly limited by the world-wide economic depression*
- *Polar meteorological and magnetic observations to be made in 1932-1933, fifty years after the first IPY*



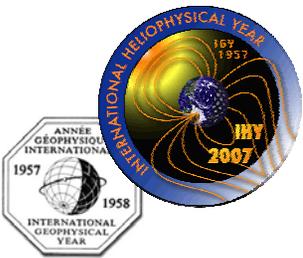
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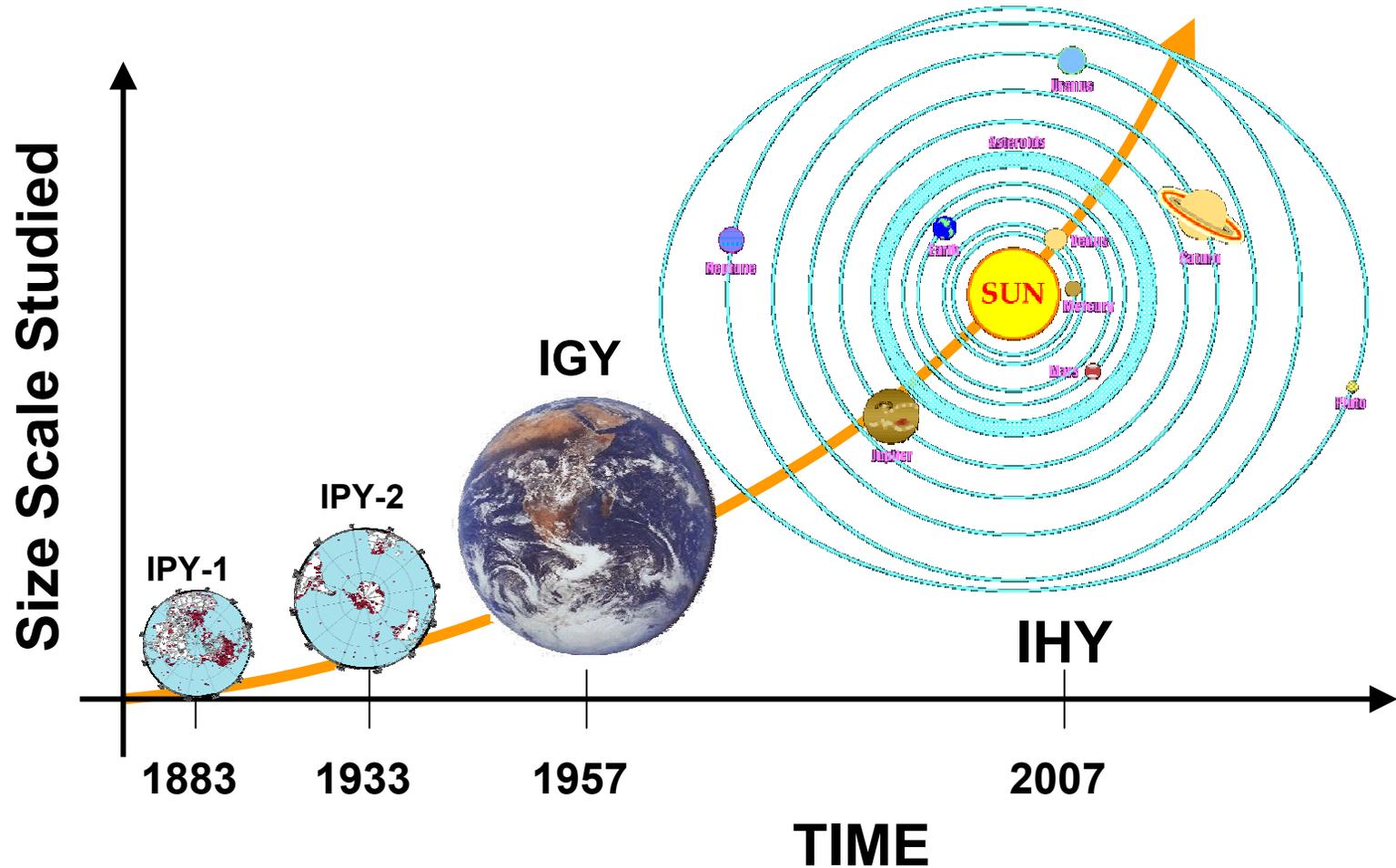
- **International Geophysical Year**

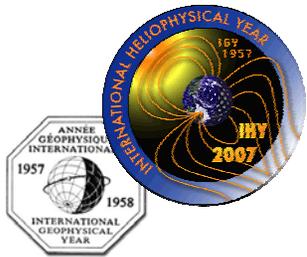
- *In 1957 the IGY involved about 60,000 scientists from 66 nations*
- *To obtain simultaneous, global observations on Earth and in space*

The logical next step is to extend global studies into the Heliosphere to incorporate the drivers of Geophysical change into the global system-The IHY.



Evolution of System Studies





IHY Overview

International

- Share costs and resources
- Coordinated use of facilities many of which are unique
- Fosters cooperation in space physics
- Most science for dollar invested
- Maximum public outreach

Heliophysical

- Cross-cutting solar system research
- Global study
- Requires broad range of scientific disciplines
- “Heliophysics”

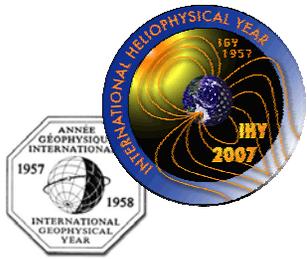
Year

- IGY and NASA 50th, ISTEP 10th
 - Maximizes public interest
 - Provides global scientific focus
- Solar Minimum
 - Sun in simplest state
 - Events well separated
- Large space fleet operating
- Focused science program
- Establish baselines
- Assess state of knowledge

UNIVERSAL PROCESSES

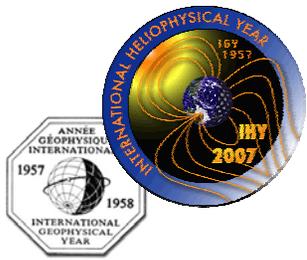
Objectives

- Understand the processes and drivers which affect the terrestrial environment and climate
- Global study of the Sun-heliopause system outward to the heliopause
- Foster international cooperation in space science
- Communicate results to the public



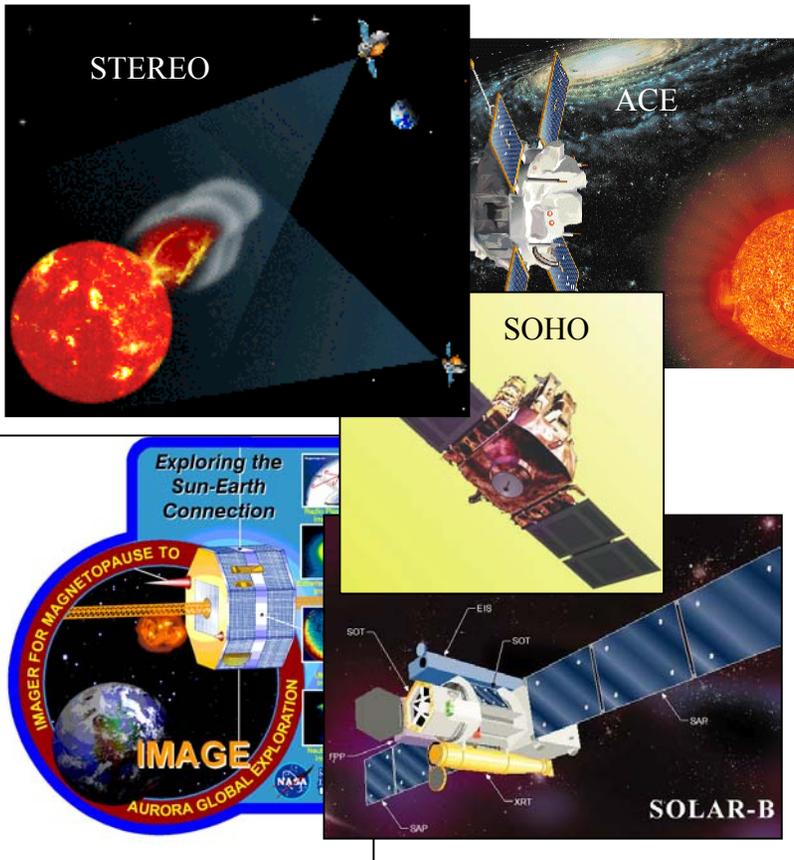
IHY Scientific Goals

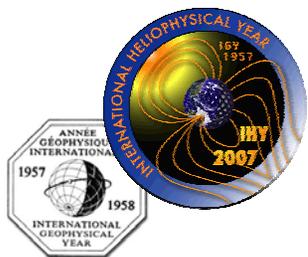
1. Understand the response of the magnetosphere, the ionosphere, the lower atmosphere and Earth surface the global processes and drivers which affect the terrestrial environment and climate
2. Global study of the Sun-heliosphere system outward to the heliopause, the new frontier
3. Foster international scientific cooperation in the study of Heliophysical phenomena now and in the future
4. Communicate the unique scientific results of the IHY to the interested scientific community and to the general public



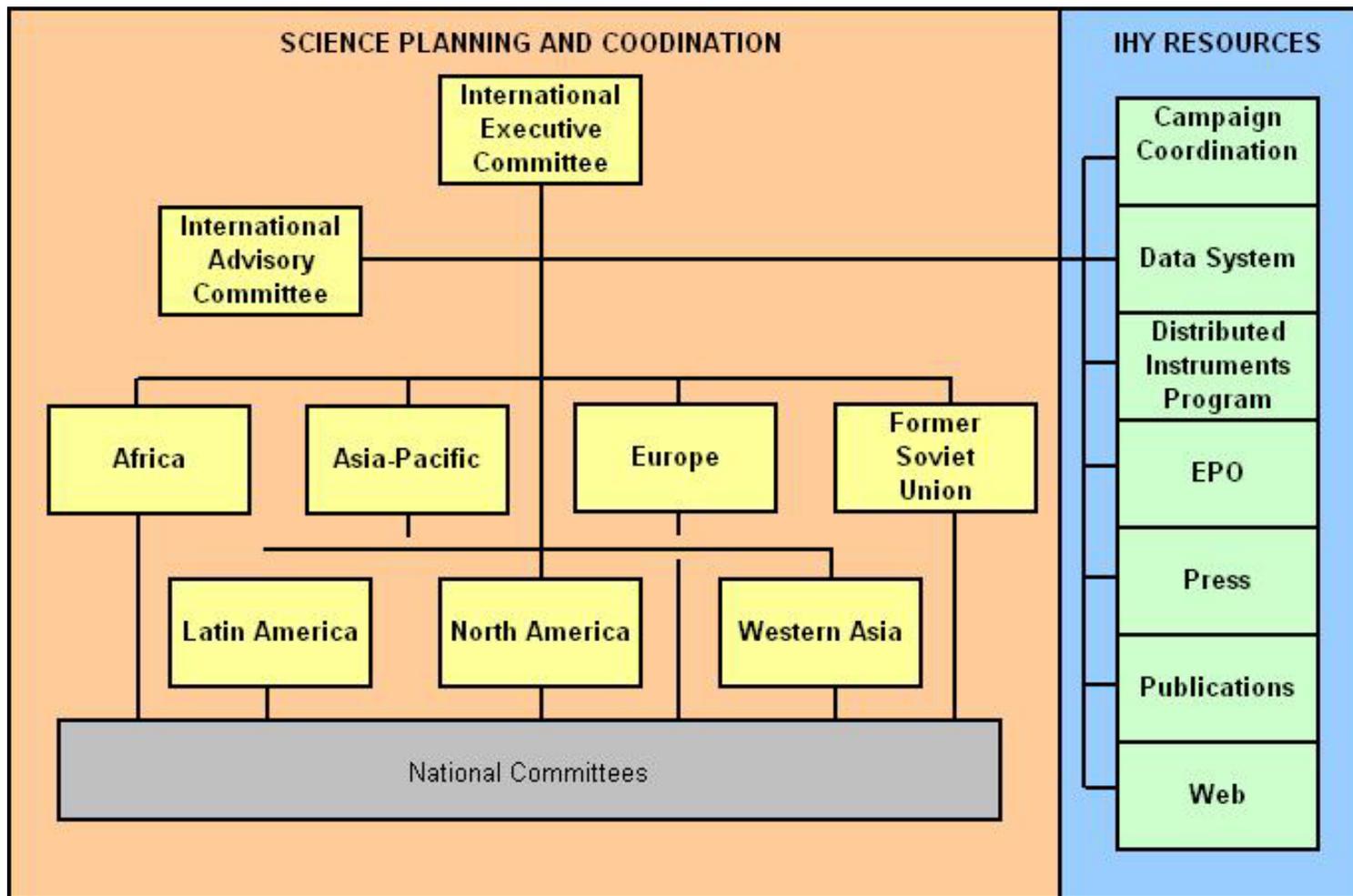
Why Now?

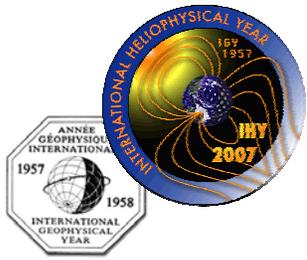
- A large armada of existing or planned spacecraft are in place to provide the most comprehensive global measurements of the sun-earth interplanetary system yet obtained
- Earth based observatories provide measurements of terrestrial effects at the poles and elsewhere
- International collaboration is easier today than in previous international years with abundant and cheap electronic communication available
- No single country has sufficient resources to obtain all required observations
- The time is ripe for IHY global studies.





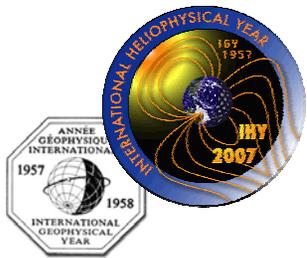
Grass-roots Planning Process





Elements of IHY Plan

- Research (observing or modeling) campaigns to study universal process in the solar system
- Participating instruments/facilities
- Distributed small instrument arrays
- Series of cross-cutting CDAW-like workshops to develop interpretations
- Publication of workshop results



What is the Opportunity?

Cross-cutting solar system science

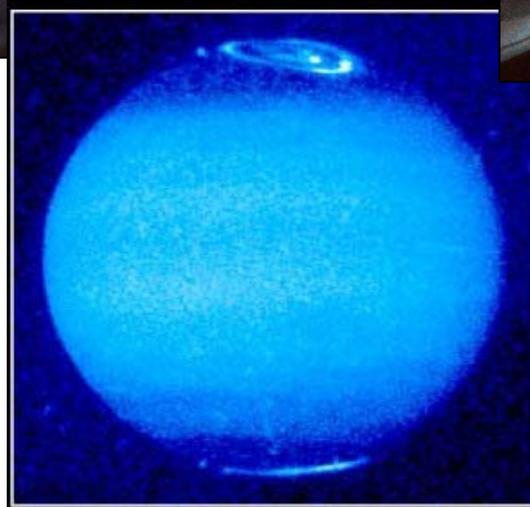


True-color image of Earth's aurora taken from Space Shuttle

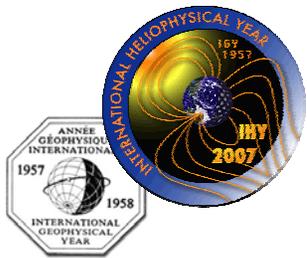


Aurora at Saturn's poles

- **Similar physical processes are evident in vastly different environments**



Jupiter's aurora imaged with HST



Universal Processes in Solar System

Processes													Objects for Comparative Studies	
Sudden energy release	Reconnection	Wave/particle interactions	Fermi acc. 1 or 2	Drift acc./pick up	Charge exchange	Ionization photo/impact	Recombination	E _i mechanisms	MHD inst.s (F,M,K-H,B)	Microinstabilities	Diffusion	Dyn. pressure/Buoyancy		
EC	EC		F						F	EC		S		Sun
F	IC		CM	SC	MS				SW		CR	X		IP Medium
	X		GIS	GIS										Comets
		PI		X	X	X				X				Mercury
SS	X			X										Venus
		PI		X	X	X	X							Earth
SS	R	RBC	BS	BS	RBC	I	I	A,R	MS	MP	RB	MP		Mars
BBF	X	PI		X	X	X	X		MP					Jupiter
														Saturn
SS	R	RBC	BS	BS	RBC	I	I	A,R	MS	MP	RB	MP		Uranus
		AKR	RBC	RBC	RBC	Io	Io		MP					Neptune
SS	R	RBC	BS	BS	RBC	I	I	A,R	MS	MP	RB	MP	Outer heliosphere	
		AKR	RBC	RBC	RBC	Titan	Titan		MP					
	R	RBC	BS	BS	RBC	I	I	A,R	MS	MP	RB	MP		
		AKR	RBC	RBC	RBC	I	I		MP					
	R	RBC	BS	BS	RBC	I	I	A,R	MS	MP	RB	MP		
		AKR	RBC	RBC	RBC	I	I		MP					
									X		CR			

KEY TO SYMBOLS

Color

Unknown or controversial

Known or not controversial

Sun

EC: Erupting CMEs

F: Flares

IC: Interchange reconnection

S: Sunspots

Interplanetary (IP) Medium

Outer Heliosphere

CIS: CIR shocks

CMS: CME shocks

CR: Cosmic ray

PI: Pickup ions

SW: Solar wind

TS: Termination shock

Planets

A: Aurora

AKR: Radio emission

BBF: Bursty bulk flows

BS: Bow shock

I: Ionosphere

IP: Ionopause

MP: Magnetopause

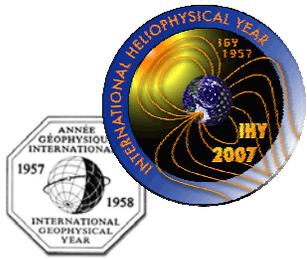
MS: Magnetosheath

R: Boundary & tail reconnection sites

RB: Radiation belts

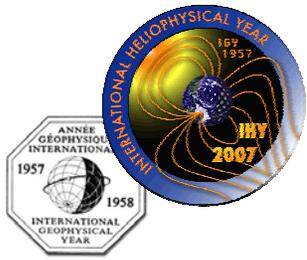
RBC: Radiation belts and/or ring current

SS: substorms



Support for the IHY

- Workshop and website support obtained for 2004 and 2005
 - *Two community workshops held April 2004, and Feb 2005*
 - *Information website developed*
 - *Campaign website in beta-test*
- UNBSS dedicated to IHY now until 2009
 - *Presentation made to Science and Technology Subcommittee in March*
 - *Three year work plan proposed and adopted*
- Secretariat support at AGU
- Other Endorsements by COSPAR, IAU



IHY Overall Schedule

- **2004:** Regional coordination meetings, campaigns begin to be defined, synergy/coordination discussions with professional organizations
- **2005:** Synthesis from regional to international, merging of science working groups and campaigns, "backfilling" missing initiatives
- **2006:** Prototyping year, preliminary work, review and finalize campaign proposals, proposals to national funding agencies
- **2007:** IHY campaigns, establish data bases and tools
- **2008-9:** CDAWs, publications, archives